CS 4110 Homework 6

Non-Regular Languages, Decidability

Chapter 10:

i. $A_1 = \{ a^n b^{n+1} \}$

$A_1 = a^p b^{p+1}$

If…

$XYZ = a^p b^{p+1}$

$abs(XY) <= p$

Then…

$X = a^m$

$Y = a^{p-m}$

$Z = b^{p+1}$

XY^2Z **not in** A_1 => Therefore non-regular

ii. $A_1 = \{ a^n b^n c^n \}$

$A_1 = a^p b^p c^p$

If…

$XYZ = a^p b^p c^p$

$abs(XY) <= p$

Then…

XY^2Z **not in** A_1 => Therefore non-regular

iii. $A_1 = \{ a^n b^{2n} \}$

$A_1 = \{ a^p b^{2p} \}$

If…

$W = XYZ$

$a^p b^{2p} = XYZ$

Then…

$X = a^m$

$Y = a^n$

$Z = a^{p-m-n}b^{2p}$

XZ *is in* A_1

XZ is not in a^pb^{2p} => Therefore non-regular

6.

$y=a^k$

$z=a^{k^2-k}$

then…

$xyz = \{a^k a^{k^2-k}\}$

$= a^{k^2-k+k}$

$= a^{k^2}$

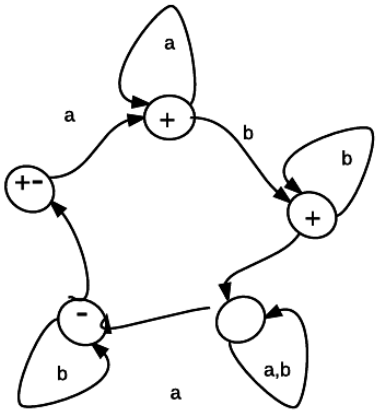
- y is not in xyz
- xy >= n
- ???

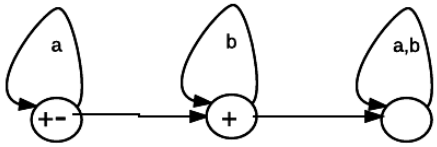
therefore…

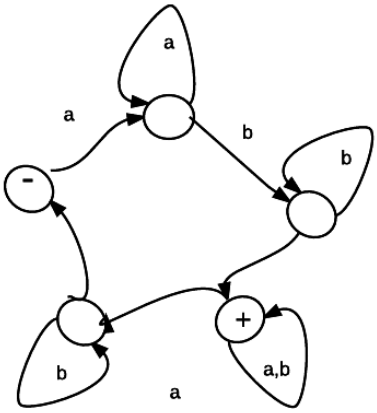
Not regular..?

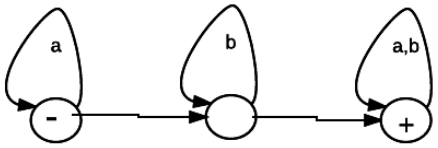
Chapter 11:

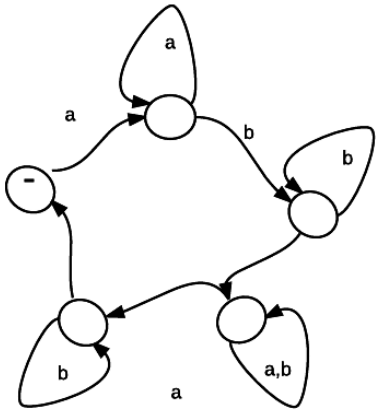
1. FA_1 and FA_2 are equivalent:

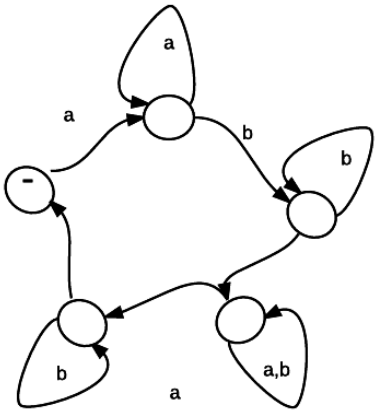




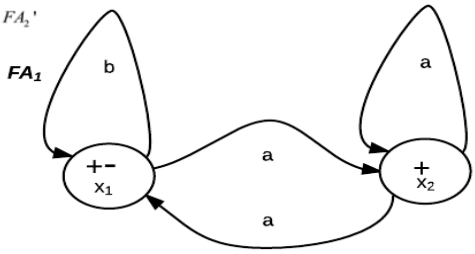


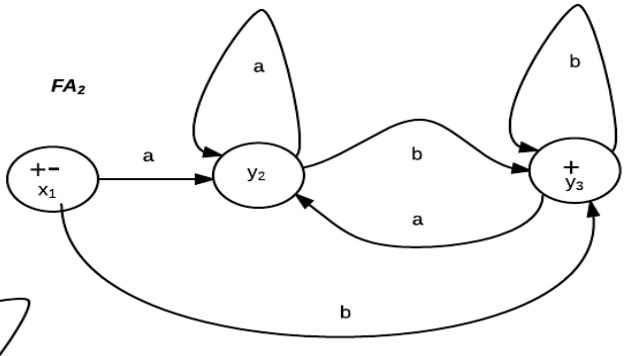


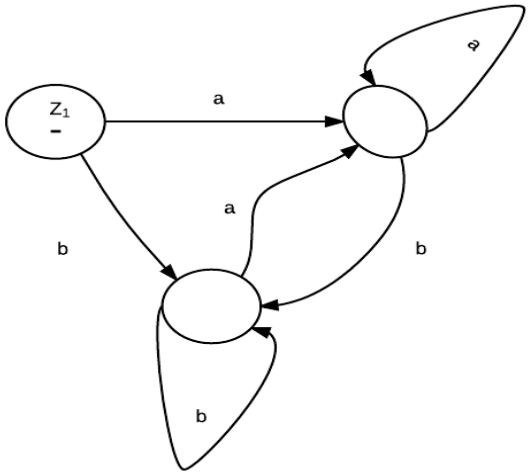




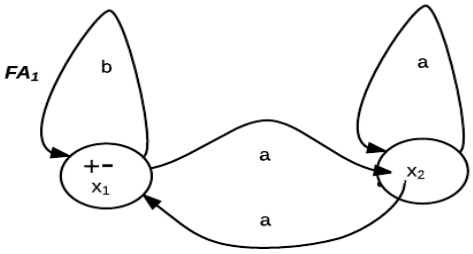
$(FA_1' + FA_2)' = FA_1 + FA_2'$

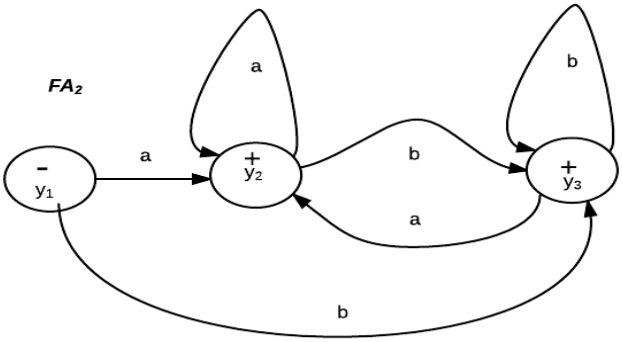


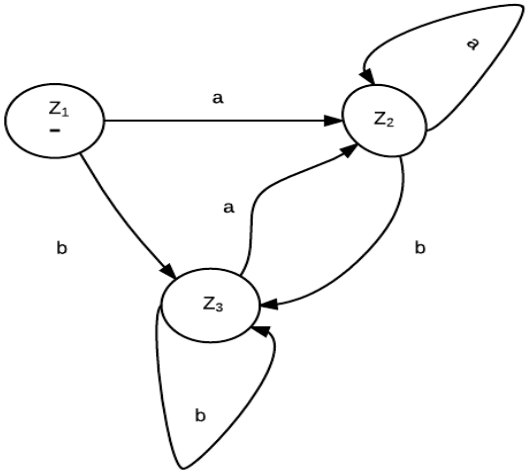




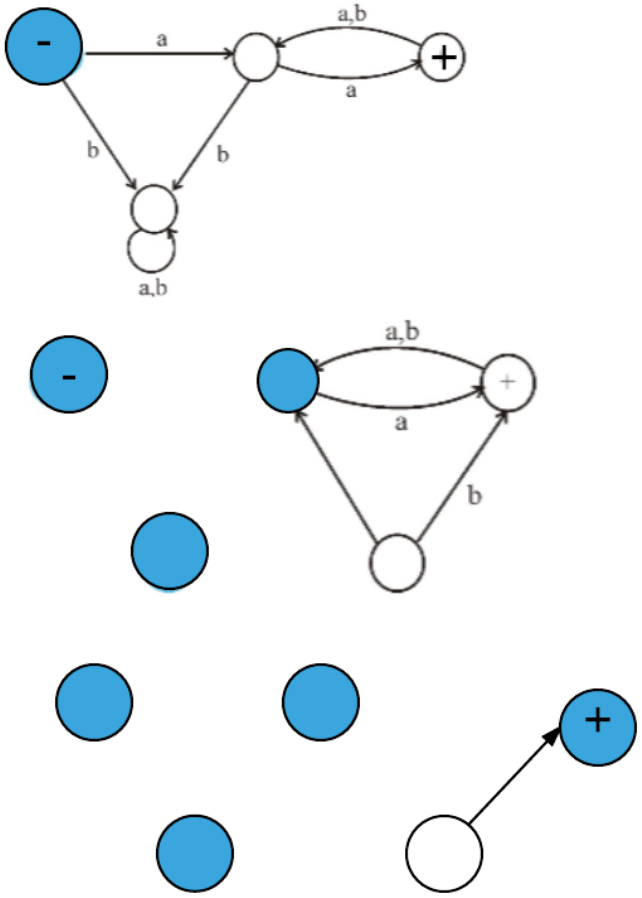
$(FA_1 + FA_2')' = FA_1' + FA_2$



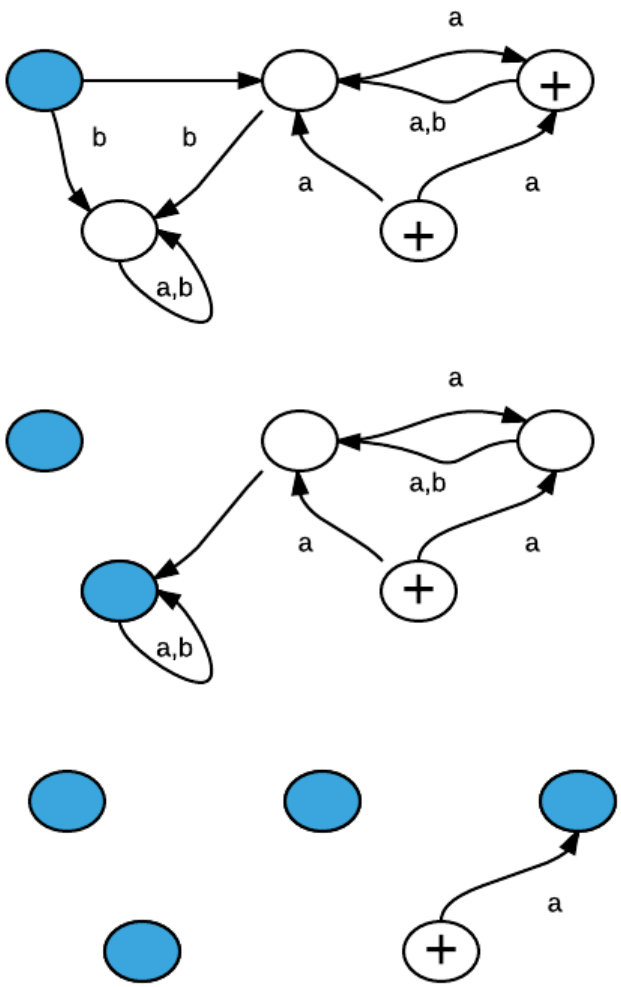




9.



10.



13.

i. - The language generated here only accepts a and ab from the starting to final states.
- Leftover strings won't make it to the final state
- Therefore this a a finite language/FA

iii.
- This language can make it to the final state, however it can also leave this state and come back.
- Due to the point above, this allows an infinite number of words to be generated from this FA thus making this an infinite language.